

# JOHNE'S DISEASE RESEARCH REPORT

Iowa State University

**NEW DEVELOPMENTS:** Research at ISU addresses problems of inaccurate diagnostic tests and lack of knowledge of the growth of causal bacteria in cattle. Currently, we cannot detect and do not understand the growth of bacteria in early infection - when cattle are infected but do not shed bacteria or have clinical signs. Progress includes the following:

- **IMPROVED DIAGNOSTIC SKIN TEST:** new mycobacterial antigen from a wild type strain of *M. avium* ss: *paratuberculosis* has been standardized, optimal concentrations for use determined, and the host response after cutaneous injection characterized. Sensitivity & specificity of the test in Iowa cattle herds is underway and preliminary data suggests the skin test reagent offers improved sensitivity.
- **HISTOCHEMICAL TEST FOR DETECTING BACTERIA IN TISSUE.** Use of genus-specific mycobacterial antigens that have improved sensitivity over standard acid-fast staining allows improved detection of bacteria in tissue. Technology transfer completed.
- **FOOD SAFETY ISSUE.** To clarify any link between bovine Johne's disease and human Crohn's disease, cooperative studies between ISU and the Mayo Clinic were designed. Intestinal biopsy tissue from human patients with Crohn's disease, ulcerative colitis, and normal colons were examined for evidence of mycobacterial infection. There was no evidence that mycobacterial antigens and DNA of *M. avium* ss: *paratuberculosis* were present in intestinal biopsy tissues of human patients with Crohn's disease. Technology transfer completed.
- **WEB SITE CREATED.** "Johne' Disease Update" placed on line.

**PROJECTS UNDERWAY:** We believe that Johne's bacteria can be effectively detected in cattle in early, pre-shedding stages of infection by a battery of tests that have increased sensitivity. Our expectations are that we will develop improved diagnostic reagents, and a better understanding of the disease that will lead to improved protocols for field-testing.

- **DEVELOP CALF MODEL OF JOHNE'S DISEASE.** This model is required for adequate assessment of new diagnostic tests and vaccines. Using oral doses of bacteria, calves examined indicate that we have a viable model.
- **DEVISE FIELD MANAGEMENT PROTOCOL.** Devise an improved field management protocol using the Jobnin test combined with serologic tests of increased diagnostic specificity and sensitivity that will lead to more accurate herd diagnosis; this process requires characterization of host responses to diagnostic test reagents and data that establish infection of cattle in preclinical and preshedding stages of disease.

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## TMDLs

"Iowa" bill (SF 2371) - IDNR to "continue the establishment of an effective and efficient method of developing a total maximum daily load program, based on information gathered on other states' programs and investigation into alternative methods for satisfying the requirements. "

Infrastructure Bill (SF 2453) "To identify an effective and efficient method of developing a total maximum daily load program. " .. \$153,000

Iowa currently has 157 waterbodies on its list of impaired waters (the 303(d) list), requiring over 200 TMDLs. With the emergence of issues like nutrient standards and a greater amount of available monitoring data, the list of impaired waters could easily grow to over 1,000 waterbodies within the next five to ten years. An EPA study found that the cost of calculating a single TMDL could range from \$4,000 to over \$1 million. Three parties have challenged the adequacy of Iowa's TMDL program in federal court and have asked the EPA to take over the program if Iowa does not carry out its TMDL charge under the Clean Water Act. New TMDL rules adopted by EPA will increase the level of resources needed.

Considering the significant cost involved in calculating TMDLs, it is important to find the most cost efficient way of carrying out the TMDL program while not sacrificing technical accuracy. The cost of actually implementing TMDLs will far exceed the cost of calculation, so doing TMDLs "on the cheap," as some states are doing, will ultimately be self defeating and cost more.

### First Year Goal

Because the data needed to calibrate and run accurate TMDL models is expensive, the initial year's goal was to begin the intensive monitoring of six impaired streams to determine the most cost effective approach for gathering water quality data needed for TMDLs. The experience gained in these pilot projects would then be used to minimize the amount and cost of up-front monitoring for successive TMDLs.

### Status

The infrastructure funds are being combined with other sources of funds to begin the intensive monitoring of 12 impaired stream segments (161 miles of streams) in east-central Iowa. The approximate cost of this project will be \$200,000 per year, with an initial equipment budget of \$100,000. In addition, a part time contract employee with some TMDL experience was recently hired to assist other TMDL staff.

The entire budget will be spent by the end of SFY 2001

Other TMDL-related activities accomplished within the past year with other sources of funding include:

- hiring a TMDL coordinator (contract) and 2 staff;
- establishing an eighteen member technical team that meets quarterly to assess the status and direction of the program;
- establishing a sixty member stakeholder group that meets every two months;
- developing a TMDL web site public information about impaired waters and the progress of TMDL's; and

(continued other side)

- completion of four TMDL's (EPA approval received for one, expected shortly for the remaining three).

Department TMDL staff are also working closely with the Geological Survey Bureau staff to develop cost-efficient, GIS-based TMDL models and coordinating water quality monitoring needs. In addition, visits were made with neighboring states' TMDL staff to provide program guidance and suggestions,

Although it was hoped that some type of "TMDL alternative" program would be possible versus individual TMDLs, it does not appear this is feasible under current laws and regulations. The new EPA TMDL regulations, when effective in October 2001, will actually increase TMDL resource needs.

### **Second Year Goal**

Assuming the entire budget is spent by the end of SFY 2001, there is no second year goal. The Department will continue to develop in-house expertise and calculate TMDLs with other sources of funds.